Amendments to the Claims

This listing of claims will replace all prior versions and listings of claims in the above-identified application.

Listing of Claims

1. **(Currently Amended)** A method of allocating bandwidth in a network comprising:
   determining a bandwidth requirement of a requested virtual path between a first node and a second node of a plurality of nodes of said network, each one of said plurality of nodes being coupled to at least one other of said plurality of nodes by at least one of a plurality of links;
   dynamically discovering a physical path from said first node to said second node by sending a message from said first node to said second node and dynamically identifying any intermediary nodes comprising said physical path in response to said sending of said message;
   determining whether said physical path has available bandwidth that is at least equal to said bandwidth requirement; and
   allocating said physical path to said requested virtual path if said bandwidth requirement is not greater than said available bandwidth.

2. **(Original)** The method of claim 1, further comprising:
   determining a quality-of-service requirement, said quality-of-service requirement being required for allocation of said requested virtual path; and
   determining whether said physical path meets said quality-of-service requirement.

3. **(Original)** The method of claim 1, further comprising:
   determining a metric requirement, said metric requirement being required for allocation of said requested virtual path; and
   determining whether said physical path meets said metric requirement.

4. **(Original)** The method of claim 3, wherein said metric requirement relates to a latency associated with said requested virtual path.

5. **(Original)** The method of claim 3, wherein said metric requirement relates to a physical distance from said first node to said second node.

6. **(Original)** The method of claim 3, wherein said metric requirement relates to a cost of service associated with said requested virtual path.

7. **(Original)** The method of claim 3, wherein said physical path is configured as a circuit, said circuit comprising said first node, certain ones of said plurality of nodes, certain ones of said plurality of links, and said second node, wherein

said first node is coupled by one of said certain ones of said plurality of links to a node of a first one of a plurality of node/link combinations,

each one of said plurality of node/link combinations comprises one of said certain ones of said plurality of nodes coupled to one of said certain ones of said plurality of links, and

a link of each one of said plurality of node/link combinations is coupled to a node of a next one of said plurality of node/link combinations, except for a link of a last one of said plurality of node/link combinations, said link of said last one of said plurality of node/link combinations being coupled to said second node.

8. **(Previously Presented)** The method of claim 1, further comprising:

repeating said dynamically discovering and said determining if said bandwidth requirement is not greater than said available bandwidth until either an acceptable physical path is found, or a determination is made that no physical path between said first and said second nodes has available bandwidth that is at least equal to said bandwidth requirement of said requested virtual path; and

allocating said acceptable physical path to said requested virtual path, if said acceptable physical path is found.

Claims 9-14 **(Canceled)**

15. **(Currently Amended)** A method of allocating bandwidth in ~~an~~ a network comprising:

requesting a virtual path between a first node and a second node of a plurality of nodes of said network, each one of said plurality of nodes being coupled to at least one other of said plurality of nodes by at least one of a plurality of links, wherein said virtual path has a bandwidth requirement associated therewith;

dynamically discovering a physical path from said first node to said second node by sending a message from said first node to said second node and dynamically identifying any intermediary nodes comprising said physical path in response to said sending of said message;

determining an amount of bandwidth available on said physical path; and

allocating at least a portion of said amount of bandwidth available on said physical path equal to said bandwidth requirement if said bandwidth requirement is not greater than said amount of bandwidth available on said physical path.

16. **(Original)** The method of claim 15, further comprising:

determining a quality-of-service requirement, said quality-of-service requirement being required for allocation of said virtual path; and

determining whether said physical path meets said quality-of-service requirement.

17. **(Original)** The method of claim 15, further comprising:

determining a metric requirement, said metric requirement being required for allocation of said virtual path; and

determining whether said physical path meets said metric requirement.

18. **(Original)** The method of claim 17, wherein said metric requirement relates to a latency associated with said virtual path.

19. **(Original)** The method of claim 17, wherein said metric requirement relates to a physical distance from said first node to said second node.

20. **(Original)** The method of claim 17, wherein said metric requirement relates to a cost of service associated with said virtual path.

21. **(Previously Presented)** The method of claim 1, wherein said allocating comprises,
dynamically configuring a set of connections between said first node, said second node,
    and said intermediary nodes, if any, using intermediary links of said plurality of links by sending a reply message in reply to said message over said intermediary links.

22. **(Previously Presented)** The method of claim 15, wherein said allocating comprises,
dynamically configuring a set of connections between said first node, said second node,
    and said intermediary nodes, if any, using intermediary links of said plurality of links by sending a reply message in reply to said message over said intermediary links.

23. **(Previously Presented)** The method of claim 1, wherein,
said determining whether said physical path has available bandwidth that is at least equal
    to said bandwidth requirement comprises,
    determining whether a plurality of available wavelength bandwidth units
        associated with said physical path is sufficient to meet said bandwidth requirement; and
said allocating comprises,
    allocating one or more of said plurality of available wavelength bandwidth units
        associated with said physical path to said requested virtual path, if said plurality of available wavelength bandwidth units associated with said physical path is sufficient to meet said bandwidth requirement.

24. **(Previously Presented)** An apparatus for allocating bandwidth in a network comprising:
means for determining a bandwidth requirement of a requested virtual path between a
    first node and a second node of a plurality of nodes of said network, each one of said plurality of nodes being coupled to at least one other of said plurality of nodes by at least one of a plurality of links;
means for dynamically discovering a physical path from said first node to said second
    node by sending a message from said first node to said second node and

dynamically identifying any intermediary nodes comprising said physical path in response to sending said message;

means for determining whether said physical path has available bandwidth that is at least equal to said bandwidth requirement; and

means for allocating said physical path to said requested virtual path if said bandwidth requirement is not greater than said available bandwidth.

25. **(Previously Presented)** The apparatus of claim 24, further comprising:

means for determining a quality-of-service requirement, said quality-of-service requirement being required for allocation of said requested virtual path; and

means for determining whether said physical path meets said quality-of-service requirement.

26. **(Previously Presented)** The apparatus of claim 24, further comprising:

means for determining a metric requirement, said metric requirement being required for allocation of said requested virtual path; and

means for determining whether said physical path meets said metric requirement.

27. **(Previously Presented)** The apparatus of claim 26, wherein said metric requirement relates to a latency associated with said requested virtual path.

28. **(Previously Presented)** The apparatus of claim 26, wherein said metric requirement relates to a physical distance from said first node to said second node.

29. **(Previously Presented)** The apparatus of claim 26, wherein said metric requirement relates to a cost of service associated with said requested virtual path.

30. **(Previously Presented)** The apparatus of claim 26, wherein said physical path is configured as a circuit, said circuit comprising said first node, certain ones of said plurality of nodes, certain ones of said plurality of links, and said second node, wherein

said first node is coupled by one of said certain ones of said plurality of links to a node of a first one of a plurality of node/link combinations, each one of said plurality of node/link combinations comprises one of said certain ones of said plurality of nodes coupled to one of said certain ones of said plurality of links, and

a link of each one of said plurality of node/link combinations is coupled to a node of a next one of said plurality of node/link combinations, except for a link of a last one of said plurality of node/link combinations, said link of said last one of said plurality of node/link combinations being coupled to said second node.

31. **(Previously Presented)** The apparatus of claim 24, wherein said means for allocating comprises,

means for dynamically configuring a set of connections between said first node, said second node, and said intermediary nodes, if any, using intermediary links of said plurality of links by sending a reply message in reply to said message over said intermediary links.

32. **(Previously Presented)** The apparatus of claim 24, wherein,

said means for determining whether said physical path has available bandwidth that is at least equal to said bandwidth requirement comprises,

means for determining whether a plurality of available wavelength bandwidth units associated with said physical path is sufficient to meet said bandwidth requirement; and

said means for allocating comprises,

means for allocating one or more of said plurality of available wavelength bandwidth units associated with said physical path to said requested virtual path, if said plurality of available wavelength bandwidth units associated with said physical path is sufficient to meet said bandwidth requirement.

33. **(Currently Amended)** A machine-readable medium having a plurality of instructions executable by a machine embodied therein, wherein said plurality of instructions when executed cause said machine to perform a method of allocating bandwidth in a network comprising:

determining a bandwidth requirement of a requested virtual path between a first node and a second node of a plurality of nodes of said network, each one of said plurality of nodes being coupled to at least one other of said plurality of nodes by at least one of a plurality of links;

dynamically discovering a physical path from said first node to said second node by sending a message from said first node to said second node and dynamically identifying any intermediary nodes comprising said physical path in response to said sending of said message;

determining whether said physical path has available bandwidth that is at least equal to said bandwidth requirement; and

allocating said physical path to said requested virtual path if said bandwidth requirement is not greater than said available bandwidth.

34. **(Previously Presented)** The machine-readable medium of claim 33, said method further comprising:

determining a quality-of-service requirement, said quality-of-service requirement being required for allocation of said requested virtual path; and

determining whether said physical path meets said quality-of-service requirement.

35. **(Previously Presented)** The machine-readable medium of claim 33, said method further comprising:

determining a metric requirement, said metric requirement being required for allocation of said requested virtual path; and

determining whether said physical path meets said metric requirement.

36. **(Previously Presented)** The machine-readable medium of claim 35, wherein said metric requirement relates to a latency associated with said requested virtual path.

37. **(Previously Presented)** The machine-readable of claim 35, wherein said metric requirement relates to a physical distance from said first node to said second node.

38. **(Previously Presented)** The machine-readable medium of claim 35, wherein said metric requirement relates to a cost of service associated with said requested virtual path.

39. **(Previously Presented)** The machine-readable medium of claim 35, wherein said physical path is configured as a circuit, said circuit comprising said first node, certain ones of said plurality of nodes, certain ones of said plurality of links, and said second node, wherein

  said first node is coupled by one of said certain ones of said plurality of links to a node of a first one of a plurality of node/link combinations,

  each one of said plurality of node/link combinations comprises one of said certain ones of said plurality of nodes coupled to one of said certain ones of said plurality of links, and

  a link of each one of said plurality of node/link combinations is coupled to a node of a next one of said plurality of node/link combinations, except for a link of a last one of said plurality of node/link combinations, said link of said last one of said plurality of node/link combinations being coupled to said second node.

40. **(Previously Presented)** The machine-readable medium of claim 33, wherein said allocating comprises,

  dynamically configuring a set of connections between said first node, said second node, and said intermediary nodes, if any, using intermediary links of said plurality of links by sending a reply message in reply to said message over said intermediary links.

41. **(Previously Presented)** The machine-readable medium of claim 33, wherein,

  said determining whether said physical path has available bandwidth that is at least equal to said bandwidth requirement comprises,

    determining whether a plurality of available wavelength bandwidth units associated with said physical path is sufficient to meet said bandwidth requirement; and

  said allocating comprises,

    allocating one or more of said plurality of available wavelength bandwidth units associated with said physical path to said requested virtual path, if said plurality of available wavelength bandwidth units associated with said physical path is sufficient to meet said bandwidth requirement.

42. **(Currently Amended)** A system for allocating bandwidth in a network comprising:
a processor configured to execute instructions; and
a memory, coupled to said processor, configured to store a plurality of instructions executable by said system, wherein said plurality of instructions when executed cause said machine to perform a method comprising:
determining a bandwidth requirement of a requested virtual path between a first node and a second node of a plurality of nodes of said network, each one of said plurality of nodes being coupled to at least one other of said plurality of nodes by at least one of a plurality of links;
dynamically discovering a physical path from said first node to said second node by sending a message from said first node to said second node and dynamically identifying any intermediary nodes comprising said physical path in response to said sending of said message;
determining whether said physical path has available bandwidth that is at least equal to said bandwidth requirement; and
allocating said physical path to said requested virtual path if said bandwidth requirement is not greater than said available bandwidth.

43. **(Previously Presented)** The system of claim 42, said method further comprising:
determining a quality-of-service requirement, said quality-of-service requirement being required for allocation of said requested virtual path; and
determining whether said physical path meets said quality-of-service requirement.

44. **(Previously Presented)** The system of claim 42, said method further comprising:
determining a metric requirement, said metric requirement being required for allocation of said requested virtual path; and
determining whether said physical path meets said metric requirement.

45. **(Previously Presented)** The system of claim 44, wherein said metric requirement relates to a latency associated with said requested virtual path.

46. **(Previously Presented)** The system of claim 44, wherein said metric requirement relates to a physical distance from said first node to said second node.

47. **(Previously Presented)** The system of claim 44, wherein said metric requirement relates to a cost of service associated with said requested virtual path.

48. **(Previously Presented)** The system of claim 44, wherein said physical path is configured as a circuit, said circuit comprising said first node, certain ones of said plurality of nodes, certain ones of said plurality of links, and said second node, wherein

said first node is coupled by one of said certain ones of said plurality of links to a node of a first one of a plurality of node/link combinations,

each one of said plurality of node/link combinations comprises one of said certain ones of said plurality of nodes coupled to one of said certain ones of said plurality of links, and

a link of each one of said plurality of node/link combinations is coupled to a node of a next one of said plurality of node/link combinations, except for a link of a last one of said plurality of node/link combinations, said link of said last one of said plurality of node/link combinations being coupled to said second node.

49. **(Previously Presented)** The system of claim 42, wherein said allocating comprises,

dynamically configuring a set of connections between said first node, said second node, and said intermediary nodes, if any, using intermediary links of said plurality of links by sending a reply message in reply to said message over said intermediary links.

50. **(Previously Presented)** The system of claim 42, wherein,

said determining whether said physical path has available bandwidth that is at least equal to said bandwidth requirement comprises,

determining whether a plurality of available wavelength bandwidth units associated with said physical path is sufficient to meet said bandwidth requirement; and

said allocating comprises,

allocating one or more of said plurality of available wavelength bandwidth units associated with said physical path to said requested virtual path, if said plurality of available wavelength bandwidth units associated with said physical path is sufficient to meet said bandwidth requirement.

51. **(Previously Presented)** A method of allocating bandwidth in a network, said method comprising:

determining an available link bandwidth for each one of a plurality of links in response to receiving a bid from at least one entity, wherein said network comprises a plurality of nodes, each one of said plurality of nodes being coupled to at least one other of said plurality of nodes by at least one of said plurality of links;

dividing said available link bandwidth for each one of said plurality of links into a plurality of bandwidth units; and

providing at least one of said plurality of bandwidth units to said at least one entity.

52. **(Previously Presented)** The method of claim 51, wherein said providing further comprises:

allocating at least one of a plurality of possible paths using at least one of said plurality of bandwidth units, wherein ones of said plurality of nodes along said at least one of a plurality of possible paths are capable of allocating and de-allocating said at least one of a plurality of possible paths at a rate that allows said provision of said bandwidth units.

53. **(Previously Presented)** The method of claim 51, wherein said available link bandwidth is bandwidth available at a given quality-of-service level.

54. **(Previously Presented)** The method of claim 51, wherein said available link bandwidth is bandwidth available with a given metric.

55. **(Previously Presented)** The method of claim 51, wherein said each one of said plurality of bandwidth units is defined by:

a bandwidth amount,
a duration, and
a start time.

56. **(Previously Presented)** The method of claim 55, wherein said each one of said plurality of bandwidth units is defined by:

a first end node and a second end node, said first and said second end nodes being among said plurality of nodes.

57. **(Previously Presented)** The method of claim 51, wherein said at least one entity is one of a plurality of entities and said providing comprises:

operating a market for sale of said plurality of bandwidth units, said at least one entity purchasing said at least one of said plurality of bandwidth units on said market.

58. **(Previously Presented)** The method of claim 57, said providing further comprising:

accepting said bid from each one of a number of said plurality of entities for at least one of a plurality of subsets of said plurality of bandwidth units; and

selecting a winning bid for said at least one of a plurality of subsets of said plurality of bandwidth units.

59. **(Previously Presented)** A machine-readable medium having a plurality of instructions executable by a machine embodied therein, wherein said plurality of instructions when executed cause said machine to perform a method of allocating bandwidth in a network comprising:

determining an available link bandwidth for each one of a plurality of links in response to receiving a bid from at least one entity, wherein said network comprises a plurality of nodes, each one of said plurality of nodes being coupled to at least one other of said plurality of nodes by at least one of said plurality of links;

dividing said available link bandwidth for each one of said plurality of links into a plurality of bandwidth units; and

providing at least one of said plurality of bandwidth units to said at least one entity.

60. **(Previously Presented)** The machine-readable medium of claim 59, wherein said providing further comprises:

allocating at least one of a plurality of possible paths using at least one of said plurality of bandwidth units, wherein ones of said plurality of nodes along said at least one of a plurality of possible paths are capable of allocating and de-allocating said at least one of a plurality of possible paths at a rate that allows said provision of said bandwidth units.

61. **(Previously Presented)** The machine-readable medium of claim 59, wherein said available link bandwidth is bandwidth available at a given quality-of-service level.

62. **(Previously Presented)** The machine-readable medium of claim 59, wherein said available link bandwidth is bandwidth available with a given metric.

63. **(Previously Presented)** The machine-readable medium of claim 59, wherein said each one of said plurality of bandwidth units is defined by:

a bandwidth amount,
a duration, and
a start time.

64. **(Previously Presented)** The machine-readable medium of claim 63, wherein said each one of said plurality of bandwidth units is defined by:

a first end node and a second end node, said first and said second end nodes being among said plurality of nodes.

65. **(Previously Presented)** The machine-readable medium of claim 59, wherein said at least one entity is one of a plurality of entities and said providing comprises:

operating a market for sale of said plurality of bandwidth units, said at least one entity purchasing said at least one of said plurality of bandwidth units on said market.

66. **(Previously Presented)** The machine-readable medium of claim 65, said providing further comprising:

accepting said bid from each one of a number of said plurality of entities for at least one of a plurality of subsets of said plurality of bandwidth units; and

selecting a winning bid for said at least one of a plurality of subsets of said plurality of bandwidth units.

67. **(Previously Presented)** A system for allocating bandwidth in a network comprising:

a processor configured to execute instructions; and

a memory, coupled to said processor, configured to store a plurality of instructions executable by said system, wherein said plurality of instructions when executed cause said machine to perform a method comprising:

determining an available link bandwidth for each one of a plurality of links in response to receiving a bid from at least one entity, wherein said network comprises a plurality of nodes, each one of said plurality of nodes being coupled to at least one other of said plurality of nodes by at least one of said plurality of links;

dividing said available link bandwidth for each one of said plurality of links into a plurality of bandwidth units; and

providing at least one of said plurality of bandwidth units to said at least one entity.

68. **(Previously Presented)** The system of claim 67, wherein said providing further comprises:

allocating at least one of a plurality of possible paths using at least one of said plurality of bandwidth units, wherein ones of said plurality of nodes along said at least one of a plurality of possible paths are capable of allocating and de-allocating said at least one of a plurality of possible paths at a rate that allows said provision of said bandwidth units.

69. **(Previously Presented)** The system of claim 67, wherein said available link bandwidth is bandwidth available at a given quality-of-service level.

70. **(Previously Presented)** The system of claim 67, wherein said available link bandwidth is bandwidth available with a given metric.

71. **(Previously Presented)** The system of claim 67, wherein said each one of said plurality of bandwidth units is defined by:

a bandwidth amount,
a duration, and
a start time.

72. **(Previously Presented)** The system of claim 71, wherein said each one of said plurality of bandwidth units is defined by:

a first end node and a second end node, said first and said second end nodes being among said plurality of nodes.

73. **(Previously Presented)** The system of claim 67, wherein said at least one entity is one of a plurality of entities and said providing comprises:

operating a market for sale of said plurality of bandwidth units, said at least one entity purchasing said at least one of said plurality of bandwidth units on said market.

74. **(Previously Presented)** The system of claim 73, said providing further comprising:

accepting said bid from each one of a number of said plurality of entities for at least one of a plurality of subsets of said plurality of bandwidth units; and

selecting a winning bid for said at least one of a plurality of subsets of said plurality of bandwidth units.

75. **(Previously Presented)** An apparatus for allocating bandwidth in a network, said apparatus comprising:

means for determining an available link bandwidth for each one of a plurality of links in response to receiving a bid from at least one entity, wherein said network comprises a plurality of nodes, each one of said plurality of nodes being coupled to at least one other of said plurality of nodes by at least one of said plurality of links;

means for dividing said available link bandwidth for each one of said plurality of links into a plurality of bandwidth units; and means for providing at least one of said plurality of bandwidth units to said at least one entity.

76. **(Previously Presented)** The apparatus of claim 75, wherein said means for providing further comprises:

means for allocating at least one of a plurality of possible paths using at least one of said plurality of bandwidth units, wherein ones of said plurality of nodes along said at least one of a plurality of possible paths are capable of allocating and de-allocating said at least one of a plurality of possible paths at a rate that allows said provision of said bandwidth units.

77. **(Previously Presented)** The apparatus of claim 75, wherein said available link bandwidth is bandwidth available at a given quality-of-service level.

78. **(Previously Presented)** The apparatus of claim 75, wherein said available link bandwidth is bandwidth available with a given metric.

79. **(Previously Presented)** The apparatus of claim 75, wherein said each one of said plurality of bandwidth units is defined by:

a bandwidth amount,
a duration, and
a start time.

80. **(Previously Presented)** The apparatus of claim 79, wherein said each one of said plurality of bandwidth units is defined by:

a first end node and a second end node, said first and said second end nodes being among said plurality of nodes.

81. **(Previously Presented)** The apparatus of claim 75, wherein said at least one entity is one of a plurality of entities and said means for providing comprises:

means for operating a market for sale of said plurality of bandwidth units, said at least one entity purchasing said at least one of said plurality of bandwidth units on said market.

82. **(Previously Presented)** The apparatus of claim 81, said means for providing further comprising:

means for accepting said bid from each one of a number of said plurality of entities for at least one of a plurality of subsets of said plurality of bandwidth units; and

means for selecting a winning bid for said at least one of a plurality of subsets of said plurality of bandwidth units.